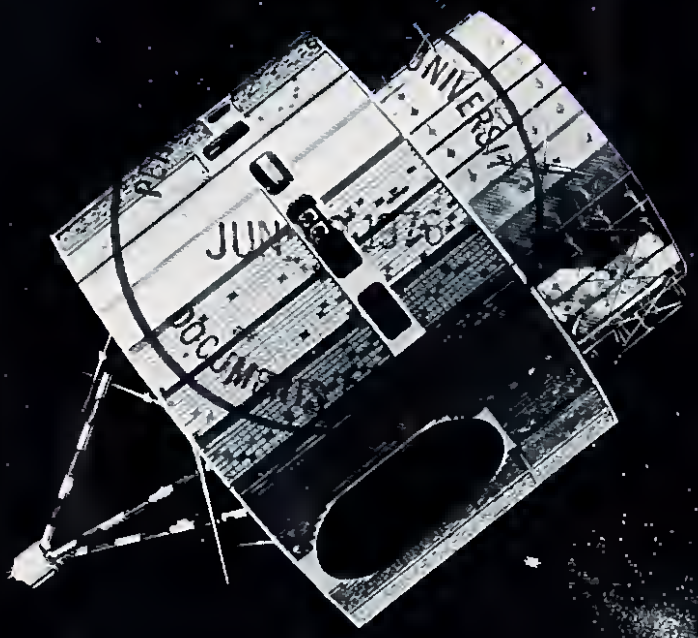
GOES

Geostationary Operational Environmental Satellite



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Environmental Satellite Service

Some 35,800 kilometers into space the satellites seem to mark time above the earth's equator, their scanners watching the planetary disc almost continuously, their communication relays passing on data from automated surface sensors, their flow of data providing environmental scientists with one of the greatest gifts thus far received from space technology—the ability to watch large and middle-scale events in the atmosphere and ocean as they unfold.

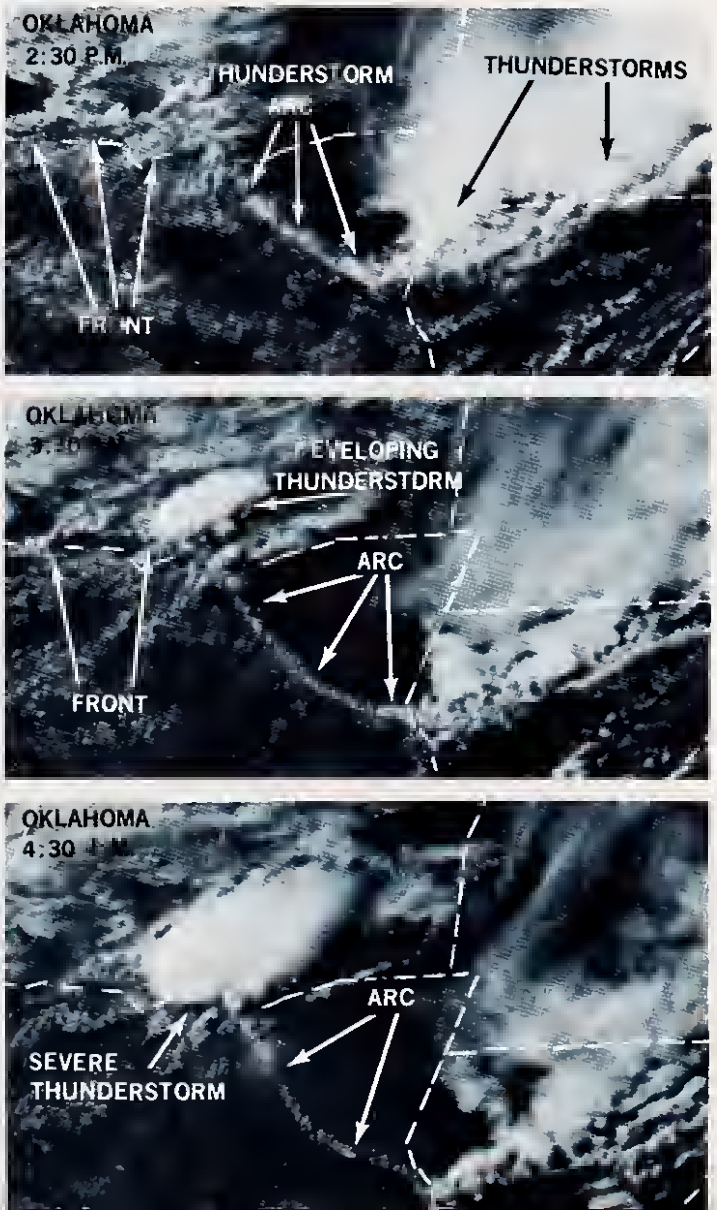
They are GOES, Geostationary Operational Environmental Satellites, operational descendants of the Applications Technology Satellites developed by the National Aeronautics and Space Administration in the 1960's. GOES have evolved from ATS experience, and from day-to-day use of geostationary satellite data in detecting and forecasting severe local storms, hurricanes, the great air masses that fight along cloudy fronts.

These satellites are part of a series of spacecraft operated by the National Environmental Satellite Service of the U.S. Commerce Department's National Oceanic and Atmospheric Administration. Other spacecraft—the NOAA series—occupy much lower, polar orbits, providing the other portion of satellite coverage that constitutes the national operational environmental satellite system.

From positions over the equator GOES "see" all of North and South America and adjacent ocean areas with good resolution, and obtain and transmit data messages from any point on the earth within their view.

The satellites are spin-stabilized, with their spin axis parallel to the earth's axis, orbiting in the plane of the equator. The spin-scan radiometer can provide visible and infrared observations of the earth below every 30 minutes, day and night. Changes in the geomagnetic field and the flow of energetic material from the sun—electrons, protons, and X-radiation—are sensed by the space environment monitor. And each satellite is a high-flying data relay system, collecting raw information from river gages, buoys, ships and other sensors for transmission to environmental centers.

One kilometer resolution satellite imagery shows a rapidly developing severe weather situation. Severe thunderstorms are generated where the thunderstorm-produced arc line intersects a frontal boundary.



This flow of images and other forms of data is transformed by scientists and equipment on the ground into satellite photographs, weather maps, measurements of changes in the space environment, the time-lapse films we see on television weather shows, analyses of wind fields, cloud temperatures and interhemisphere mixing, and buoy-gathered data on the marine environment and its life.

But the geostationary satellite's most important contribution may be its ability to show, in virtual real time, destructive natural events at several scales of size and motion.

A developing local storm comes beneath a polar-orbiting satellite's scanners only once each twelve hours, and some events—the ones of such crucial importance to human safety—have formed, done their damage, and decayed long before that time has elapsed. Thus, the half-hourly pictures from GOES have become a vital element in NOAA's national severe storm warning apparatus.

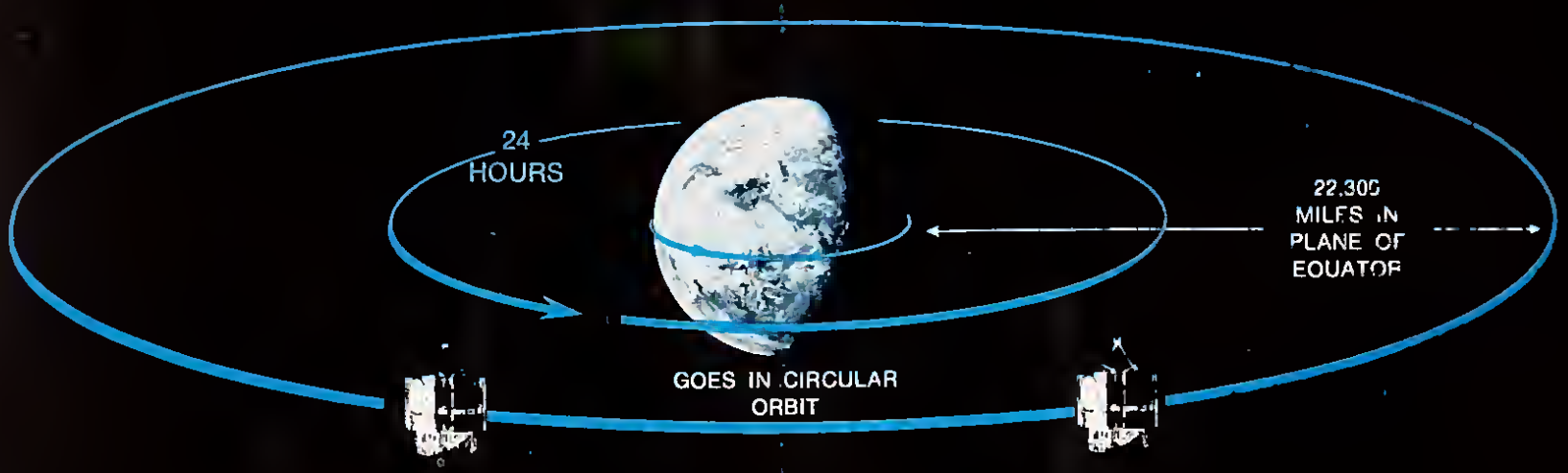
GOES have enhanced the warning systems developed for larger storms, particularly hurricanes and their larger, less violent extratropical cousins. The geostationary view permits better estimates of storm track, wind fields, temperatures, and, on the global scale, distribution of energy; revealing which weather systems are contributing to or drawing off the storm's energy, and what steering forces are at work.

NOAA's Pacafic Tsunami Warning System sees the spacecraft as a communications relay for seismic and wave sensors around the ocean, to help provide timely warning of these earthquake-generated waves. The Environmental Research Laboratories in Boulder, Colo. use space environment data to prepare timely warnings of potentially hazardous increases in solar activity, and their probable effects on earth. National Weather Service hydrologists use the GOES data-relay capability to obtain rainfall and river flow information from automatic sensors, as they monitor flood hazards along the Nation's rivers.

GOES are versatile spacecraft. Their potential is just beginning to be tapped.

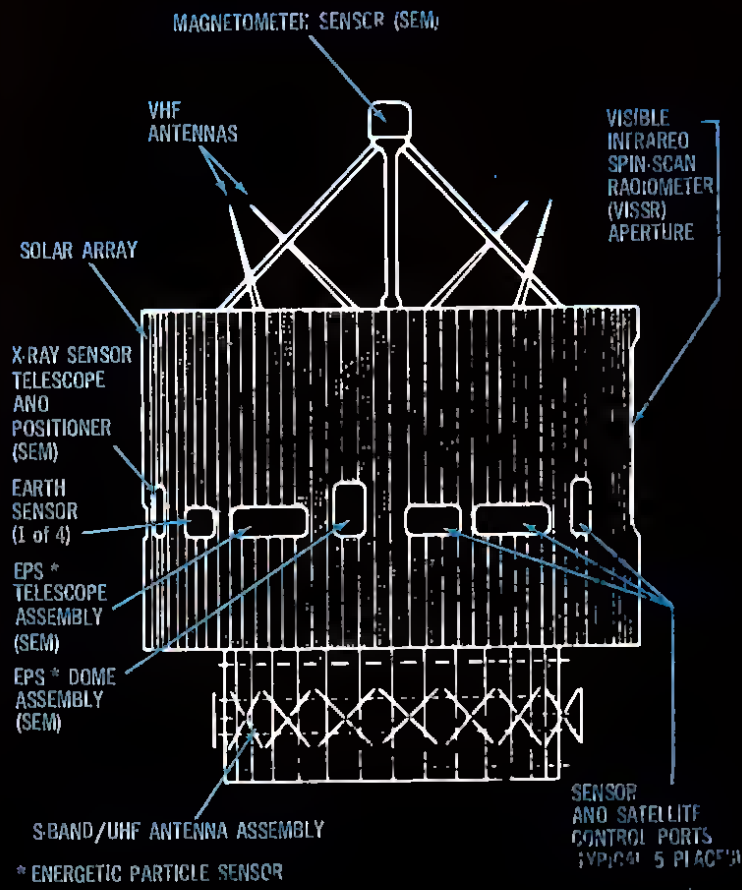
In order to speed GOES data to Weather Service Offices at the local and regional levels—where forecasters must deal with such "short-fused" weather occurrences as thunderstorms and tornadoes—the National Environmental Satellite Service field organization includes Satellite Field Services Stations. These stations are mainly concerned with receiving, processing, interpreting, and disseminating GOES data. They are located adjacent to the following National Weather Service facilities: the National Severe Storms Forecast Center in Kansas City, Mo.; the National Hurricane Center in Miami, Fla.; and the Weather Service Forecast offices in San Francisco, Calif., Honolulu, Hawaii, Washington, D.C., and Anchorage, Alaska

GEOSTATIONARY (OR SYNCHRONOUS) ORBIT



An object injected at sufficient speed, in the right direction, can be orbited at any altitude above the atmosphere; however, as the distance between satellite and planet increases, the speed required to maintain an orbit decreases. At an altitude of about 35,800 km, the orbital speed is down to about 1,094 km per hour, and the period of the circular orbit becomes 24 hours. If this 35,800-km-high orbit lies in the plane of the earth's equator, the satellite and earth turn through the same arc distance in the same time, so that the satellite is always above the same point on the equator—that is, the satellite is geostationary.

Two GOES spacecraft, in geostationary orbit over the equatorial Atlantic and Pacific, provide coverage of a large portion of the Western Hemisphere.



NOAA and its National Environmental Satellite Service work at the threshold of man's ability to observe the environment from space. NESS operates the Nation's civil operational environmental satellite system and is developing new ways of using this system and its massive output of environmental data for the general benefit.

NESS headquarters are in Federal Office Building 4, Suitland, Md. The Command and Data Acquisition station for GOES is located at Wallops Station, Va. Selected National Weather Service offices have been equipped to receive and handle GOES imagery relayed to them through the NESS Central Data Distribution Facility and Satellite Field Services Stations.

Global weather is international. NOAA's National Environmental Satellite Service is a major element in the United States' World Meteorological Center in Washington, along with NOAA's National Meteorological Center and Environmental Data Service. This is one of three world data centers established under the United Nations' World Meteorological Organization; the others are in Moscow and Melbourne.

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